CORONA J

PERFORMANCE EVALUATION REPORT

MISSION 1109-1 AND 1109-2

FTV 1657, CR-10

Approved [redacted]
Manager
Advanced Projects

Approved [redacted]
Manager
Program [redacted]

[redacted]

"C" files - 1109

~~TOP SECRET~~/C

[redacted]

29 October 1970

To: [redacted]

Thru:

From:

Subject: MISSION 1109 FINAL REPORT (CR-10)

Enclosed is the final evaluation report for Mission 1109.

[redacted]
Manager
Advanced Projects

IF ENCLOSURES [illegible] THE CLASSIFICATION OF THIS DOCUMENT WILL BE CHANGED TO Unclassified

~~TOP SECRET~~/C

[redacted]

FOREWORD

This report details the performance of the payload system during the operational phase of the Program [redacted] Flight Test Vehicle 1657.

Lockheed Missiles and Space Company has the responsibility for evaluating payload performance under the Level of Effort and "J" System contracts.

This document constitutes the final payload test and performance evaluation report for Mission 1109 which was launched 4 March 1970.

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INTRODUCTION

This report presents the final performance evaluation of Missions 1109-1 and 1109-2 of the Corona Program. The purpose of this report is to define the performance characteristics of the CR-10 payload system and to identify the source of in-flight anomalies.

The performance evaluation was jointly conducted by representatives of Lockheed Missiles and Space Company (LMSC) and ITEK at the facilities of NPIC and AFSPPF. The off-line evaluation of Corona engineering photography acquired over the United States was performed at the individual contractors plants.

The quantitative data used for this report is obtained from government organizations. The diffuse density data, and MTF/AIM resolution are produced by AFSPPF. The vehicle attitude error values and frame correlation times are made at NPIC who also supply the Processing Summary reports published by [redacted]

Computer programs developed by A/P are utilized to calculate and plot the frequency distribution of the various contributors to image smear to permit analysis and correlation of the conditions of photography to the information content and quality of the acquired pictures. Computer analysis of the exposure, processing and illumination data provides the necessary data to analyze the exposure criteria selected for the mission.

This report contains certain data summarized from [redacted] Processing Summary, and from AFSPPF TERO Report for this mission.

SECTION 1

MISSION SUMMARY

A. MISSION OBJECTIVES

The payload section of Mission 1109, placed into orbit by Flight Test Vehicle 1657 and THORAD Booster (SLV-2H) S/N 041, consisted of two panoramic cameras, one DISIC camera, two Mark 5A recovery capsules and a space structure to enclose the cameras and provide mounting surfaces for all equipment. Figure 1-1 presents an inboard profile of the CR-10 payload system. The Corona "J" system was designed to acquire search and reconnaissance photography of selected areas of the earth from orbital altitudes. A seven day -1 mission and a twelve day -2 mission was planned.

B. MISSION DESCRIPTION

The payload was launched from Vandenberg Air Force Base (VAFB) at 2215:002 (1415:00PST) on 4 March 1970. Ascent and injection were normal and the achieved orbit was within nominal tolerances. Tracking and command support was effected by the Air Force Satellite Control Facility consisting of tracking and command stations at [redacted] under central control of the Satellite Test Center at Sunnyvale, California. Mission 1109-1 consisted of a seven day operation and was completed by air recovery on 11 February 1970. Mission 1109-2 was completed with an air recovery on 23 February 1970 following a twelve day photographic operation.

The comparison of the planned and actual orbit parameters is tabulated as follows:

ORBITAL PARAMETERS

Parameter	Planned	Orbit 2 Actuals
Period (Min.)	88.92	88.38
Perigee (N.M.)	81.3	83.7
Apogee (N.M.)	162.5	140.3
Inclination (Deg.)	88.0	88.00
Perigee Latitude (Deg. N)	33.0	57.75
Eccentricity	0.0115	.0082

Five drag make-up rockets were fired during Mission 1109-1, and two during 1109-2.

C. PANORAMIC CAMERAS

The forward and aft looking instruments operated satisfactorily throughout both missions, and produced good to fair imagery except where degraded by atmospheric haze. Both instruments contained 16,300 feet of standard base type 3404 film which passed into the recovery system without a wrap-up.

D. DISIC CAMERA

The DISIC camera operated satisfactorily throughout both missions. Although several characteristic markings are present on the record, no significant photographic degradation occurred. Most starboard and port point stellar images were of good quality. The index record is also good and slightly better than that obtained from previous missions.

E. OTHER SUB-SYSTEMS

The pressure make-up unit, the clock and the thermal control subsystems performed satisfactorily, as did the digital shift register portion of the command system V/h and exposure programmer.

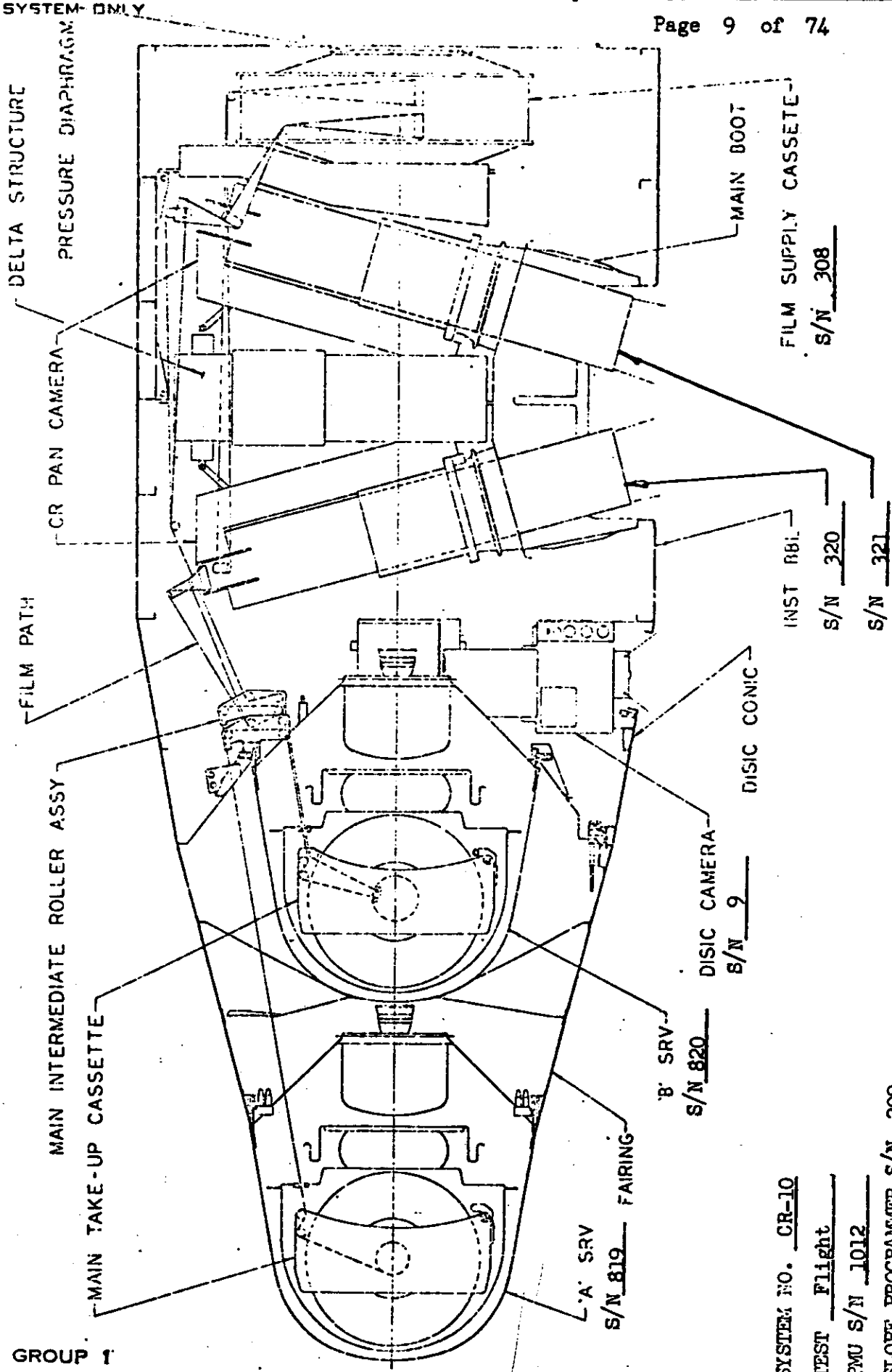


FIGURE 1-1: INBOARD PROFILE

SYSTEM NO. CR-10
TEST Flight
PMU S/N 1012
SLOPE PROGRAMMER S/N 209
CLOCK S/N 628
SWITCH PROGRAMMER S/N 212

F. COMPONENT IDENTIFICATIONS AND SETTINGS

1. Forward Looking Panoramic Camera

a. Component Assignment

Component	Serial No.
Main Camera	321
Main Camera Lens	I211
Supply Horizon Camera Lens	E23769
Take-up Horizon Camera Lens	E23775

b. Camera Data and Flight Settings

Main Camera:

Lens	24" f/3.5
Slit Widths	
S_1	0.180"
S_2	0.214"
S_3	0.261"
S_4	0.145"
F/S	0.210"
Filter Types	
Primary	Wratten 25
Secondary	Wratten 23A
Film Types	Eastman Type 3404 (16,300 ft.)

Supply (Port) Horizon Camera:

Lens	45.4 mm f/6.3
Aperture Setting	f/6.3
Exposure Time	1/100 second
Filter Type	Wratten 25

Take-up (Starboard) Horizon Camera:

Lens	45.4 mm f/6.3
Aperture Setting	f/8.0
Exposure Time	1/100 second
Filter Type	Wratten 25

2. Aft Looking Panoramic Camera

a. Component Assignment

Component	Serial No.
Main Camera	320
Main Camera Lens	I212
Supply Horizon Camera Lens	E23803
Take-up Horizon Camera Lens	E23794

b. Camera Data and F ight Settings

Main Camera:

Lens	24" f/3.5
Slit Widths	
S_1	0.150"
S_2	0.197"
S_3	0.238"
S_4	0.267"
F/S	0.164"
Filter Types	
Primary	Wratten 23A
Secondary	Wratten 25
Film Types	
Primary	Eastman Type 3404 (16,300 ft.)

Supply (Starboard) Horizon Camera:

Lens	45.3 mm/f6.3
Aperture Setting	f/8.0
Exposure Time	1/50 second
Filter Type	Wratten 25

Take-up (Port) Horizon Camera:

Lens	45.4 mm f/6.3
Aperture Setting	f/6.3
Exposure Time	1/100 second
Filter Type	Wratten 25

3. DISIC Camera

a. Component Assignment

Component	Serial No.
Camera	009
Index Reseau	112
Stellar Reseaus	
Port	13P
Starboard	9

b. Camera Data and Flight Settings

Stellar Cameras:

Lens	3.0 in.f/2.8
Exposure Time	1.5 seconds
Filter Type	3401 (2000 ft.)
Film Type	Eastman Type 3401 (2000 ft.)

Index Camera:

Lens	3 in. f/6.3
Exposure Time	1/500 second
Filter Type	Wratten 12
Film Type	Eastman 3400 (2200 ft.)

SECTION 2

PRE-FLIGHT SYSTEMS TEST

The CR payload systems are subjected to a sequential series of tests required to demonstrate a satisfactory confidence level in the flightworthiness of the systems. These tests include static verification, dynamic performance, operation in simulated thermal-altitude environment, light leak evaluation and dynamic photographic performance measurements. Significant baselines experienced on CR-10 during pre-flight testing are as follows:

A. ENVIRONMENTAL TESTING

Payload system CR-10 was tested twice in the environmental HIVOS chamber; in standard configuration from October 24 through October 30, 1969, and again from January 8 through January 12, 1970.

1. HIVOS Test No. 1

Pan Instruments

Standard base 3404 film was used in both forward and aft instruments for the -1 mission simulation. Special color film, SO-242 was spliced onto the tail end of both supplies. Standard base 3400 film was used on both the DISIC Terrain and Stellar units.

With the PMU disabled, at a pressure of 3 to 5 microns of mercury, the 3404 film showed start-up corona, and was found to be within acceptance levels. Upon enabling the PMU, no marking was evidenced.

Unacceptable corona (2 π) was produced by instrument No. 1 at pressures between 11 and 36 microns during pressure sweeps.

Minimal start-up corona occurred on several operations in which color film was used during inactive PMU periods. Both instruments showed no marking during PMU operation or during pressure sweeps on No. 2 instrument. Instrument No. 1 went into fail-safe prior to pressure sweeps.

Instrument No. 1 sheared a pin in the output metering roller 1739 frames into the -2 mission. The sheared pin was attributed to a splice peel-back. Because of this failure, pressure sweeps on the SO-242 were not obtained.

DISIC Camera

The DISIC Terrain manifested no corona during the -1 mission, but 46% of the -2 mission was marked when pressures measured less than 10 microns of mercury.

The DISIC Stellar camera showed corona on all starboard formats of the -1 mission. Approximately 70% of the starboard and port formats of the -2 mission were marked. Some of this marking was attributable to the SLP data head clamping pressure.

Except as noted, the DISIC performed satisfactorily throughout the -1 mission, but the Stellar unit, after DISIC cut and splice, indicated slow "B" take up. Although the metering continued to degrade during the -2 mission, the mission was completed.

Command System

The AGE command system utilized a programmed "H" timer tape to simulate all Uncle commands, except as follows: PMU Enable/Disable, DSR Load Enable, Load and Logic Enable (Uncle 200-245). These commands were issued manually. Only minor problems occurred in commanding and these were corrected by repunching the "H" timer tape.

Both the V/h programmer (Slope) and exposure programmer (Switch) operated satisfactorily through the test. The computed accuracy of these functions was found to be within design specification.

The Clock/IRIG "C" accuracy when computed over a 5 day period, was within the 10 ms/day criteria.

The PMU performed normally.

2. HIVOS Test No. 2

Pan Instruments

The CR-10 payload was tested the second time in the HIVOS chamber between 8 and 12 January 1970. Both panoramic cameras were loaded with standard thin base 3404 film. Start-up corona was evident at pressures from 2.2 to 4.4 microns, but the density and extent of the marking was found to be within acceptable levels. Film from No. 1 pan camera (S/N 320) manifested a two inch square mark, which correspondingly occurred at 6.5 microns, but being trivial, was waived. Pan camera No. 2 (S/N 321) manifested corona during the pressure sweep sequence (86-98 microns), but, the marking density was low. In as much as the corona was light and also beyond the PMU normal pressure range, these markings were also waived.

The main instruments operated satisfactorily throughout the second HIVOS test except:

a. The specification limit of 100 ms between centers of format was exceeded when instrument No. 2 required 450 ms longer to actuate the first c/f switch. The High Efficiency Amplifier, HEA, is suspect.

b. The slit drive was sluggish on instrument No. 1 at altitude. Further chamber tests are contemplated.

DISIC

Generally, satisfactory performance throughout the test. A new take-up unit was used during this test. The terrain film was generally free from corona marking. Some electrostatic discharges along the film edge affected 15 frames. It is uncertain whether this marking occurred during test or retrieval, nevertheless it was within acceptable levels. The stellar film had a + density streak for 122 frames and may have been corona. The density of the streak was 0.06 above reseau fog in formats. Between formats, the density of the streak did not exceed 0.02 above base fog. 6% of the test formats were affected but, the marking was within acceptance levels.

Subsystem Performance

No anomales in performance were experienced in either the V/h or exposure programmer, both operated satisfactorily throughout the test. When the cycle rates were computed, they were found to be within specifications.

The Clock/IRIG "C" accuracy check over a 3 day period, when computed, was found to have an error less than the 10 ms/day criteria.

The PMU operated normally throughout the test.

B. RESOLUTION TEST

Three weeks of resolution testing on CR-10 were concluded on December 13. Some initial difficulties in ascertaining the location of peak focus were resolved by revised criteria provided by ITEK.

The results of the thru focus resolution tests on the pan instruments showed the following characteristics:

Aft-looking Instrument S/N 320 -

Maximum low contrast resolution 165 lines/mm at 0.0006 peak focal position.

Forward-looking Instrument S/N 321 -

Maximum low contrast resolution 208 lines/mm at 0.0003 peak focal position.

The final test data for both instruments is shown in Figures 2-1 and 2-2. Both instruments met the system requirements specification.

C. LIGHT LEAK TEST

The photomultiplier light search test conducted after flight loading indicated that the system was free of any light leaks. Evaluation of the flight test specimens that were later retrieved and processed also showed that the system was light tight.

D. FLIGHT LOADING AND CERTIFICATION

The DISIC #9 was loaded and installed in the CR-10 system on 24 February 1970. The pan CR-10 system was also loaded on 24 February 1970. Film samples taken from both DISIC and pan systems were processed and evaluated. They were free of physical defects and the photographic characteristics were satisfactory. All functions were normal, and as noted in the preceding paragraph, the light leak search test showed that the system was light tight.

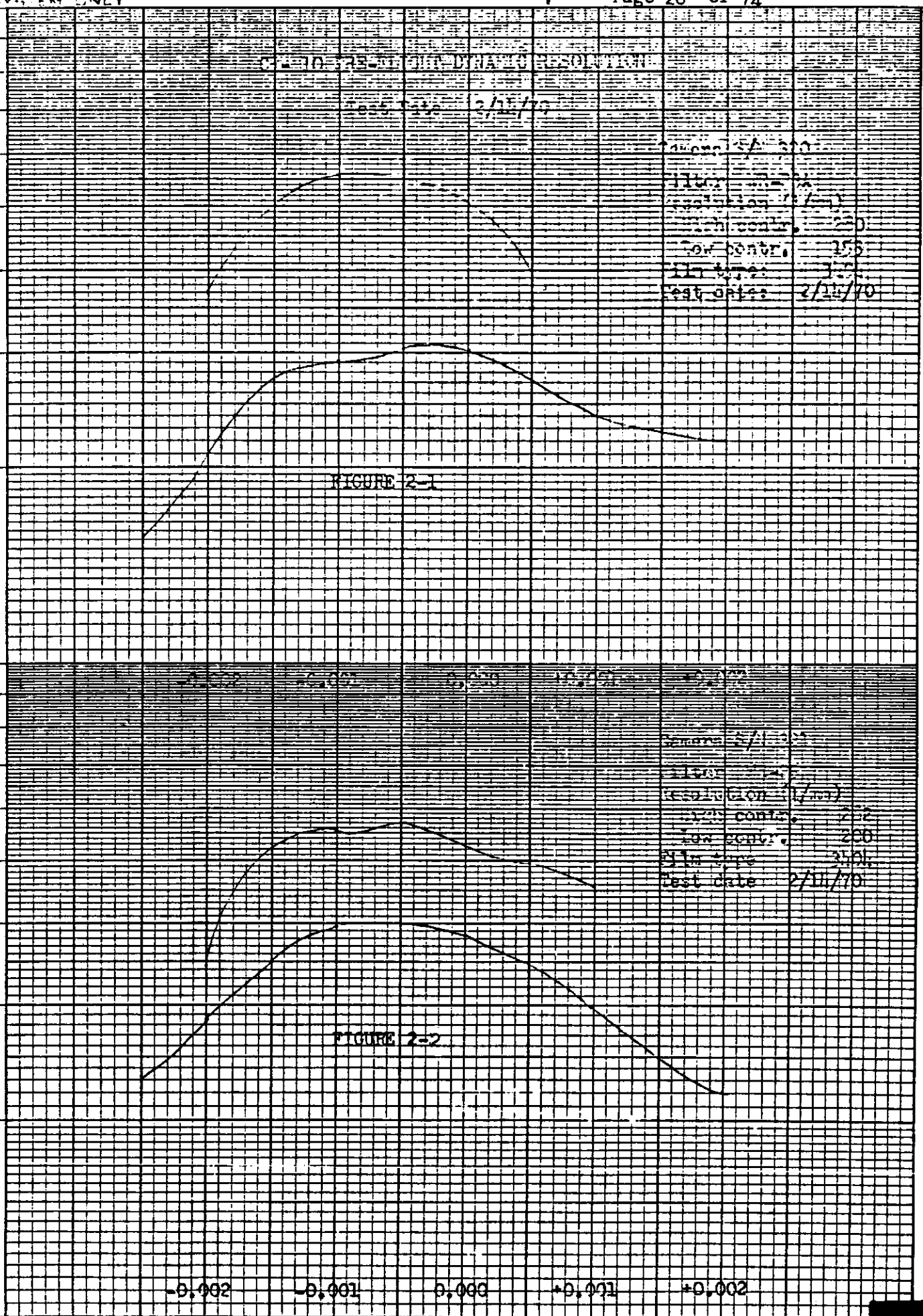


FIGURE 2-1

FIGURE 2-2

SEMI-LOGARITHMIC 359-61
KEUFFEL & ESSER CO. MADE IN U.S.A.
2 CYCLES X 70 DIVISIONS

SECTION 3

FLIGHT OPERATIONS

A. SUMMARY

Lift-off for Vehicle 1657 occurred at 14:07:00 GMT on 4 March 1970, using the SLC-3 west pad, from Vandenberg. The planned mission objective of 19 days was concluded with successful recoveries of the -1 mission after 7 days and the -2 mission after an additional 12 days.

Reset (door ejection), A/P to Orbit Mode, Instrumentation Switchover, and Panoramic Camera Transfer to Orbit Mode occurred as programmed.

Because of a "cold burn", the booster went to fuel depletion, and the velocity meter shut down occurred seven seconds late. The Agena made up all but 48FPS of the 233 FPS which the "cold burn" caused. As a result of this disparity in velocity, the orbital period was approximately 30 seconds shorter than predicted, making the attained orbit outside the 3 σ dispersion.

Both panoramic cameras operated normally, throughout both missions exhausting their film supply during Revs 300 and 301 for instruments 320 and 321 respectively.

The DISIC system also functioned satisfactorily during both missions. The DISIC terrain film supply was exhausted during Rev 296 and the last titled stellar format occurred during Rev 300. Cut, splice and transfer transpired as programmed and were satisfactory.

The Real Time Command (RTC) system operation, utilizing both "Uncle" and "Silo" command systems operated satisfactorily throughout the flight. The Digital Storage Register (DSR) performed satisfactorily throughout the flight.

A satisfactory match of the required FMC was maintained during both the -1 and -2 missions.

The clock system operated normally and satisfactorily. Satisfactory clock/system time correlation was obtained.

The slit control programmer operated satisfactorily during both missions, however, the majority of operations were made with the control in a fixed slit position.

PMU operation throughout the flight was satisfactory. The gas consumption rate was such that, at the conclusion of the -2 mission, the gas supply had not depleted.

The SRV tape recorder tape from the -1 mission experienced a high loss of synchronization in the ADAPS processor. The tape recorder in the -2 mission, however, performed satisfactorily.

The -1 mission recovery capsule was successfully recovered by air catch. All re-entry events were within tolerance. The impact was within tolerance, although not as predicted.

The -2 recovery was also successfully recovered by air catch. All re-entry events were within tolerance as was the point of impact.

DMU Operation

Seven DMU rockets were used for period control and orbit adjust to satisfactorily maintain ground tracks. Rockets #1 and #2 were fired on Revs 3 and 4 for orbit adjust of approximately 30 seconds which resulted from the "cold booster". Rockets 3, 4 and 5 were fired on Revs 27, 60 and 87 respectively with nominal performance and gas usage. Rockets 6 and 7 were fired during the -2 mission on Revs 150 and 223 again with nominal performance and gas usage.

A compromise was necessary during Rev 206 to achieve a desired perigee altitude and/or location to allow the ground track to cover a desired target. The compromise did not degrade mission performance.

The following is a summary of the DMU firings:

Rocket No.	Pass Fired	System Time (Sec.)	Period Change (Sec.)	Velocity Change Ft/Sec.	Period at Firing
1	3	07798	15.10	25.22	88.24
2	4	15523	10,44	16.61	88.38
3	27	51372	15.50	24.70	88.40
4	60	548895	10.60	16.95	88.43
5	87	26814	15.62	24.80	88.42
6	150	16020	17.50	27.92	88.39
7	223	59586	17.39	27.77	88.32

Figures 3-1 and 3-3 are plots of orbit history and operation distribution data.

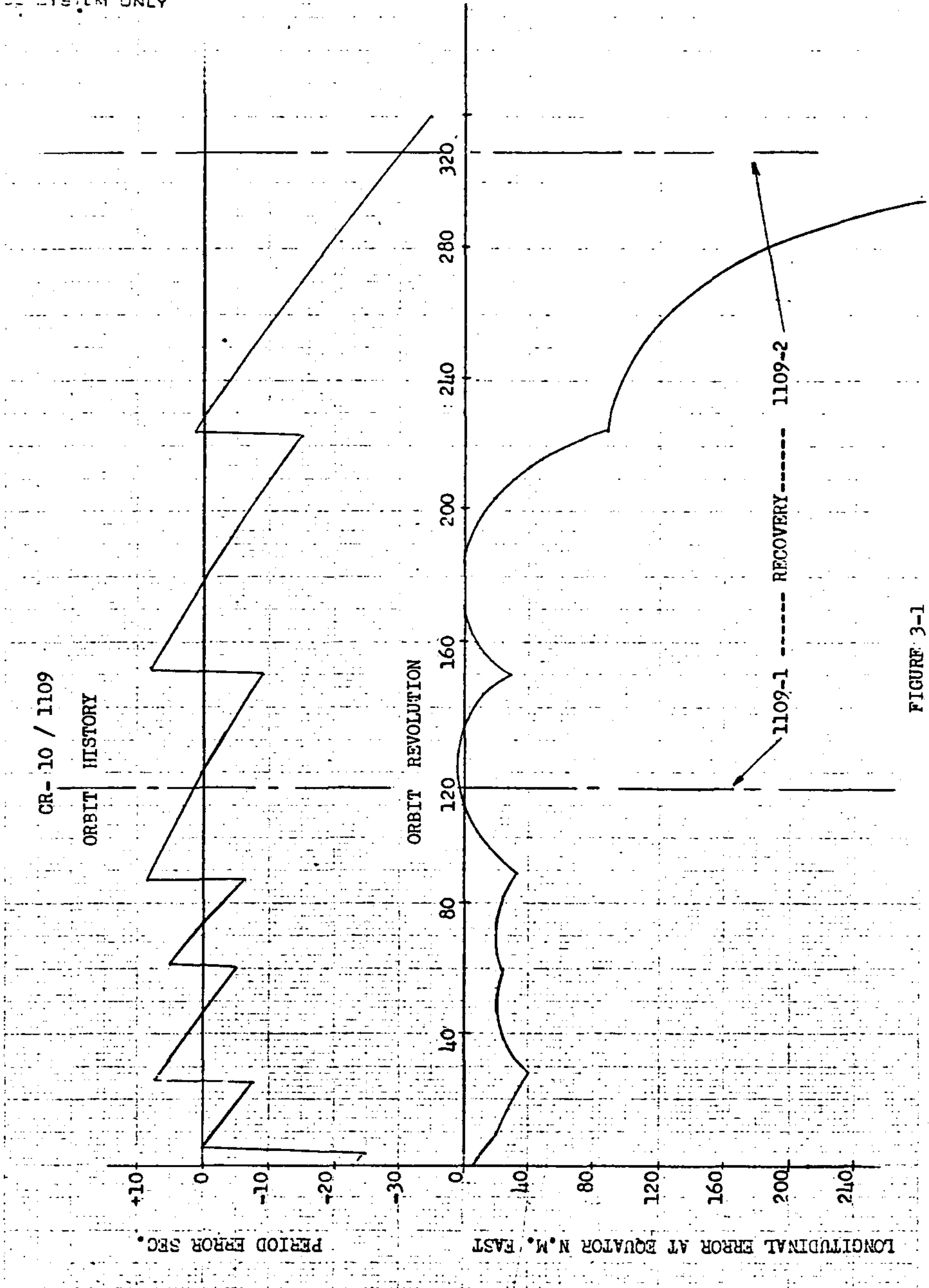

CR-10 / 1109
ORBIT HISTORY
ORBIT REVOLUTION
40
80
120
160
200
240
280
320
+10
0
-10
-20
-30
PERIOD ERROR SEC.
0
40
80
120
160
200
240
LONGITUDINAL ERROR AT EQUATOR N.M. EAST
1109-1 ------ RECOVERY ------ 1109-2

FIGURE 3-1

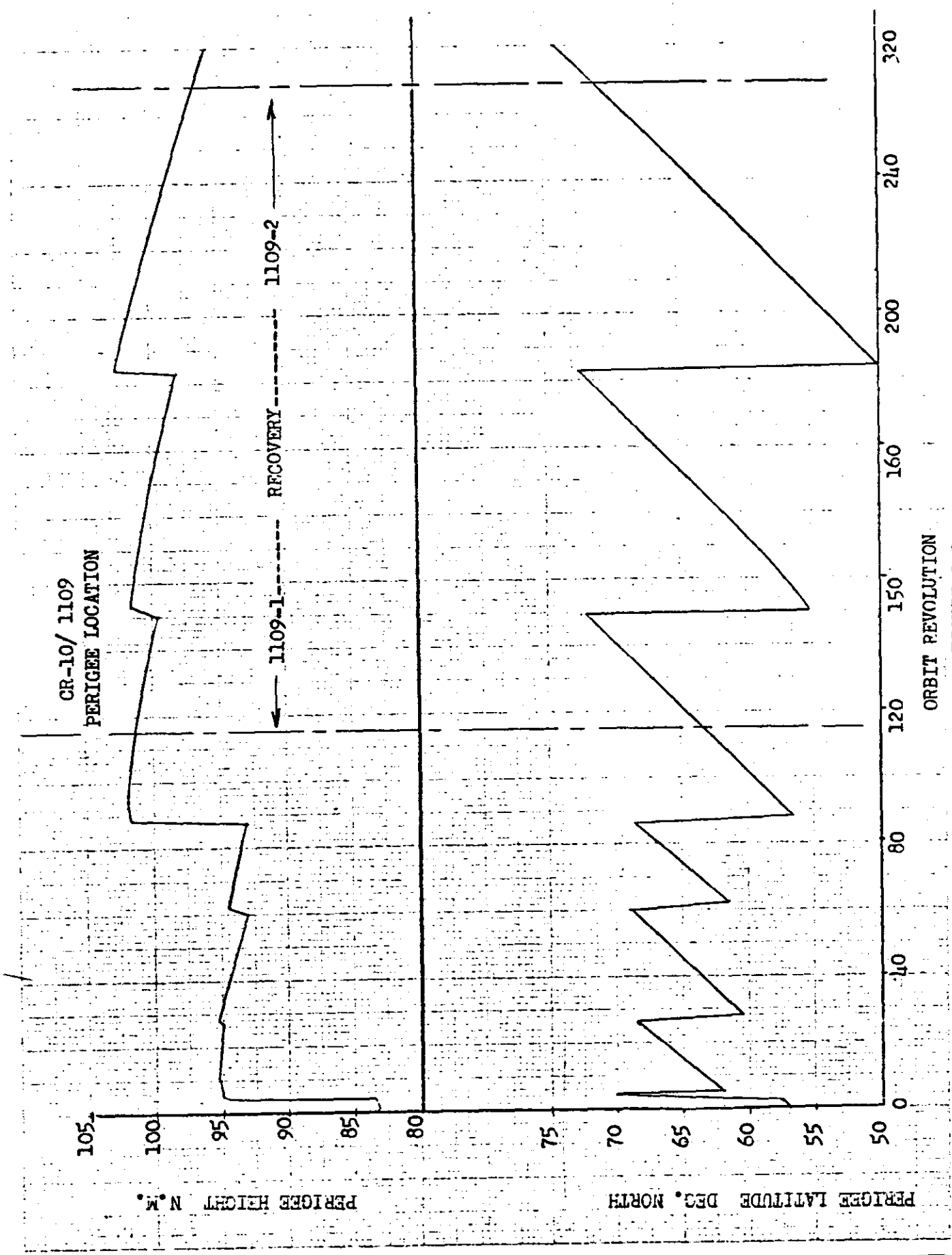
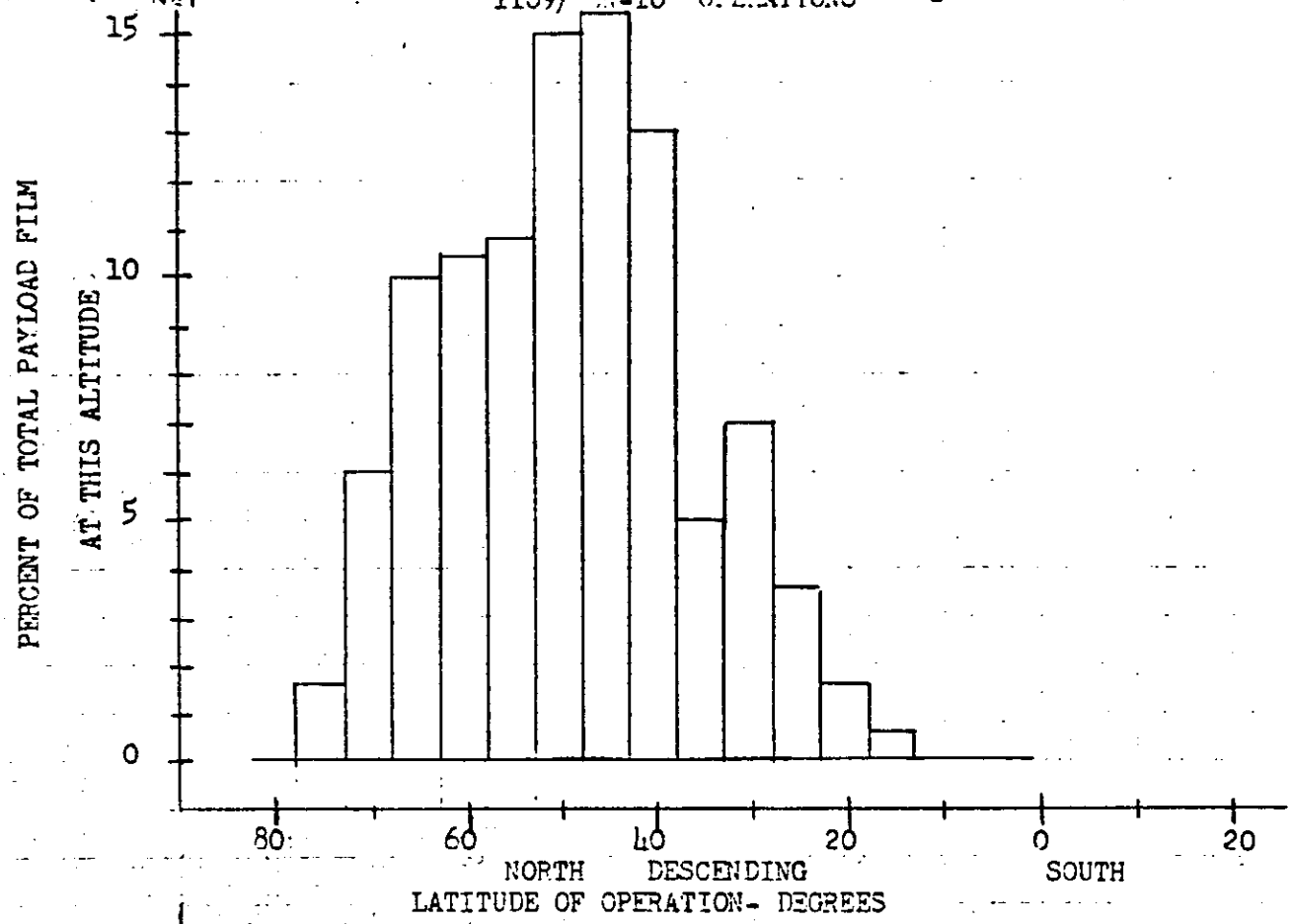

PERIGEE LATITUDE DEG. NORTH
PERIGEE HEIGHT N.M.
ORBIT REVOLUTION
CR-10/ 1109
PERIGEE LOCATION
1109-1
RECOVERY
1109-2
105
100
95
90
85
80
75
70
65
60
55
50
0
40
80
120
150
160
200
240
320

FIGURE 3-2



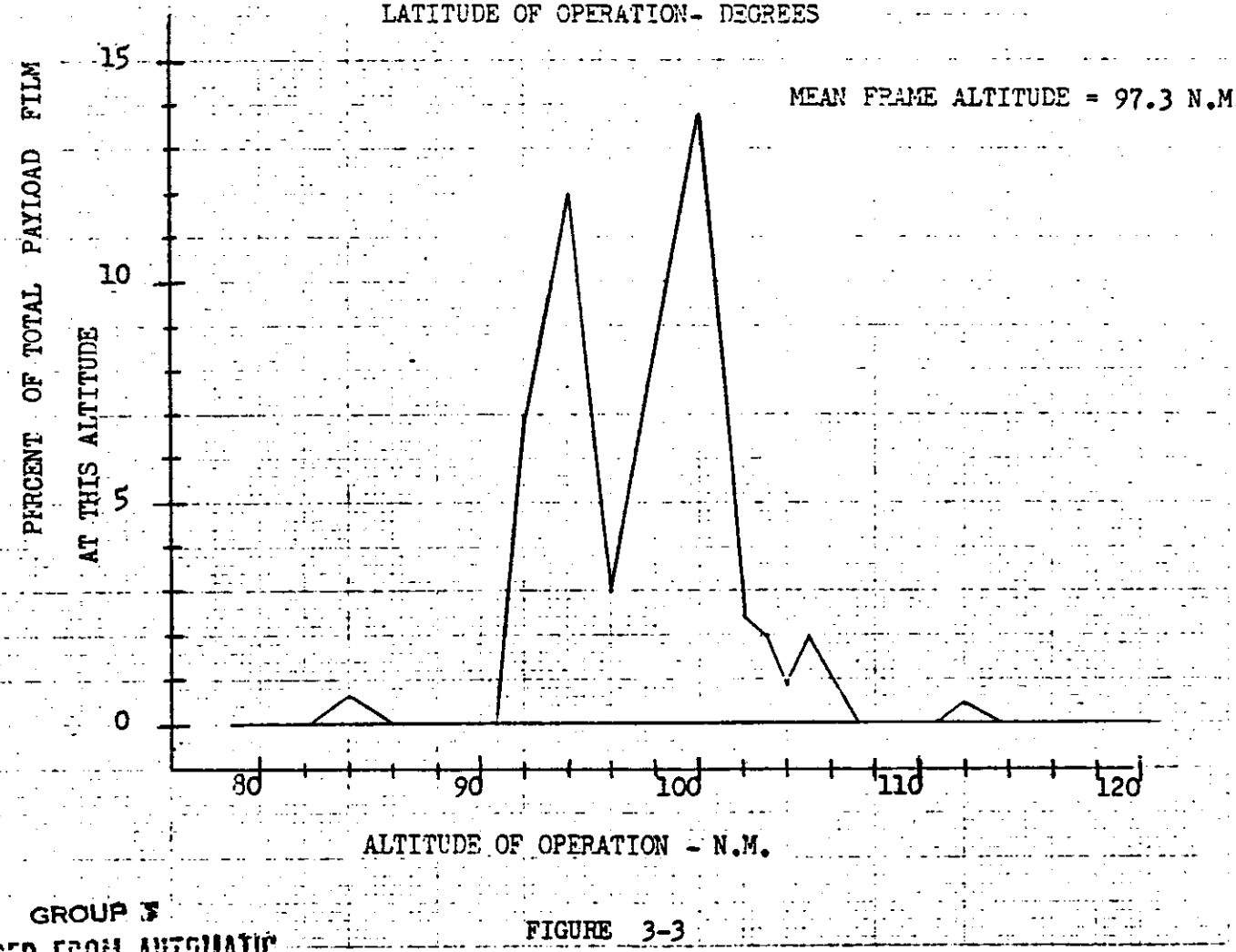


FIGURE 3-3

B. ORBITAL PARAMETERS

The following tabulation describes the orbital parameters achieved, as a result of the booster "cold burn", as compared to those predicted.

Parameter	Predicted	Tolerance	Actual STC	Actual APF
Period (Min)	88.92	+0.92, -0.45	88.41	88.38
Perigee (nm)	81.3	+6, -6	84.1	83.7
Apogee (nm)	162.5	+11, -19	141.3	140.3
Eccentricity	0.0115	+0.0020, -0.0031	0.0078	0.0082
Inclination (Deg)	88.00	+0.22, -0.16	88.01	88.00
Argument of Perigee(Deg)	147	+47, -46	120.1	122.0
Regression Rate (Deg/Rev)	22.31	-------	22.18	22.23
Perigee Latitude (Deg N.)	33	+48, -49	-----	57.75

C. PANORAMIC CAMERA PERFORMANCE

Both panoramic cameras #320 and #321 exhibited normal film transport characteristics and operated satisfactorily throughout the flight. Each of the cameras was loaded with 16,300 feet of standard base type 3404 film, which passed the tag end into the recovery systems without a film wrap-up. Film depletion for camera #320 occurred on frame 53 during Rev 300, and frame 9 during Rev 301 of panoramic camera #321.

	Panoramic Camera #320	Panoramic Camera #321
Sample	20	30
Pre-Launch	123	124
-1 Mission	3010	3005
-2 Mission	3030	3046

D. DISIC PERFORMANCE

The DISIC camera performed satisfactorily throughout the -1 and -2 missions. The terrain camera was loaded with 2200 feet of type 3400 and the stellar camera with 2000 feet of type 3401 film.

Cut, splice and transfer to the second recovery system were commanded by KIK-SILO 39 on Rev 109. All events occurred as programmed satisfactorily. The terrain instrument depleted its film during frame 12 on Rev 296. The stellar instrument film was not exhausted at the -2 mission recovery.

Film consumption, in frames, occurred as listed:

	Stellar	Terrain
Sample	20	24
Pre-Launch	60	108
-1 Mission	2406	2427
-2 Mission	2780	2681
Total	5266	5240

E. INSTRUMENTATION AND COMMAND SYSTEM PERFORMANCE

The command and instrumentation system utilized the Space Ground Link Equipment (SGLE). Pan camera ON-OFF in the normal operating mode utilized a cascade of H timer stored commands enabled by the Digital Shift Register (DSR). An emergency operating mode capability also existed.

Both the command and instrumentation systems performed satisfactorily throughout both missions. Mission 1109 was the first flight to utilize SILO 327 operational-diagnostic data selection.

F. FORWARD MOTION COMPENSATION PERFORMANCE

A match of the required FMC to the actual attained was within the prescribed limits of less than ± 1% for most operations. The mean error for the -1 mission was -0.30% for a total of 2946 frames and the 1σ dispersion was 0.87%. The mean error for the -2 mission was -0.27% for a total of 3155 frames and the 1 σ dispersion was 0.66%.

Figures 3-4 and 3-5 show the central tendency of the V/h error for the -1 mission. When compared with Figures 3-6 and 3-7, which represent the -2 mission, the dispersion is greater. The difference in dispersion is a result of the "cold burn" of the booster. Later in Revs 3 and 4, DMU rockets #1 and #2 were fired to correct the period and orbit parameters.

Initial flight FMC settings for the eccentricity function period was 3900 seconds and the delay step increment was set at 50 seconds. The oblateness function period was set at 2622 seconds with a gain factor of 0.0998.

Both the oblateness and yaw functions were normal and satisfactory.

G. EXPOSURE CONTROL SYSTEM PERFORMANCE

The exposure control programmer functioned satisfactorily throughout both missions although the majority of operations were taken in fixed slit positions because of orbit exposure requirements.

Initial settings were T_1 60 seconds, T_2 (DISIC exposure to 1/500) 380 seconds, T_3 (Slit position 3 duration) 400 seconds, T_4 (Slit position 2 duration) 40 seconds, T_5 (DISIC exposure to 1/250) 100 seconds and T_6 (420-T_1) = 360 seconds.

FRAMES 1-3 OF EACH OP OMITTED 90 PERCENT = 1.55

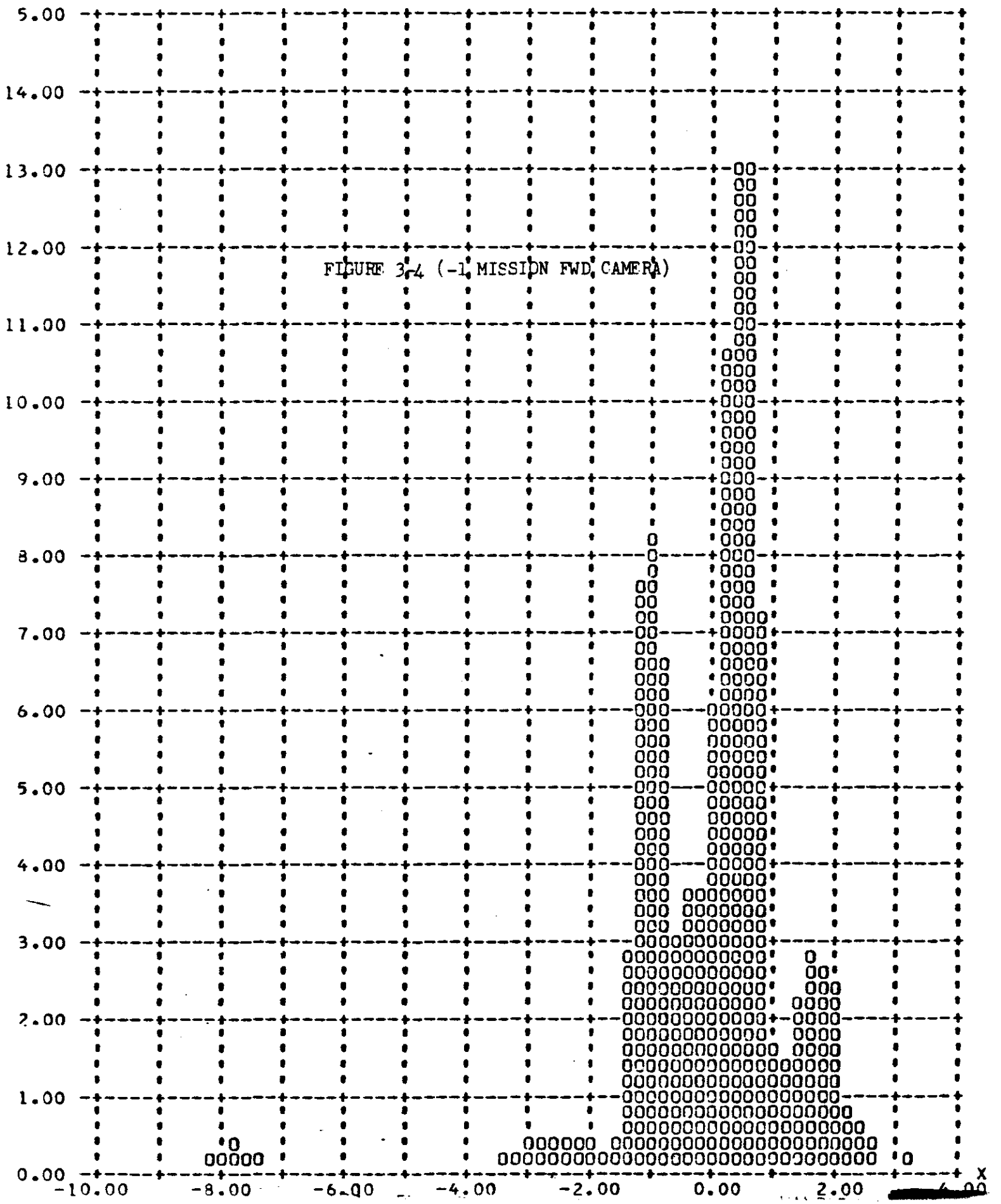


FIGURE 3-4 (-1 MISSION FWD CAMERA)

FRAMES 1-3 OF EACH OP OMITTED 90 PERCENT = 1.56

Y V/H RATIO ERROR - PERCENT (X) VERSUS FREQUENCY - PERCENT (Y)

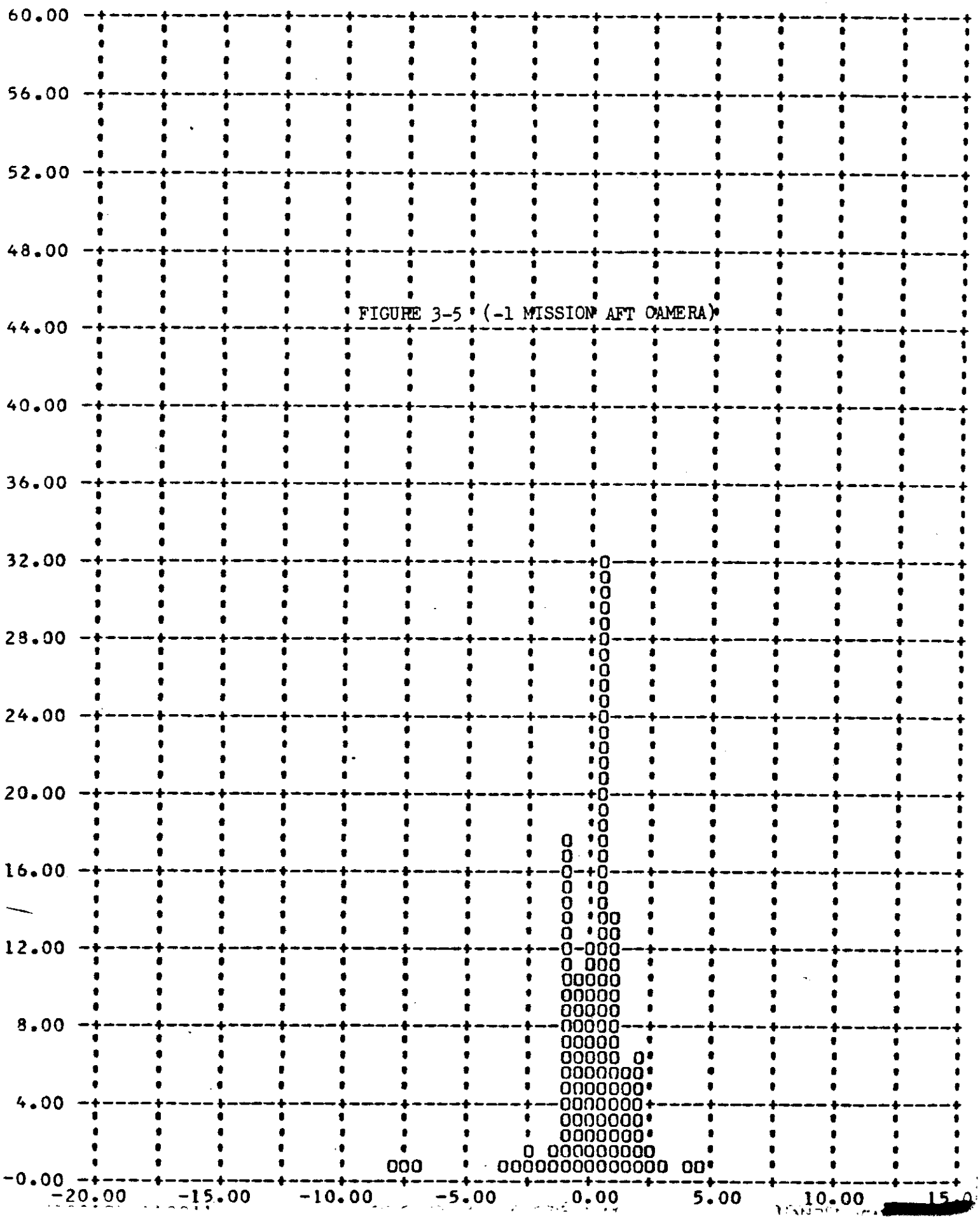


FIGURE 3-5 (-1 MISSION AFT CAMERA)

FRAMES 1-3 OF EACH OP OMITTED 90 PERCENT = 1.13

Y V/H RATIO ERROR - PERCENT (X) VERSUS FREQUENCY - PERCENT (Y)

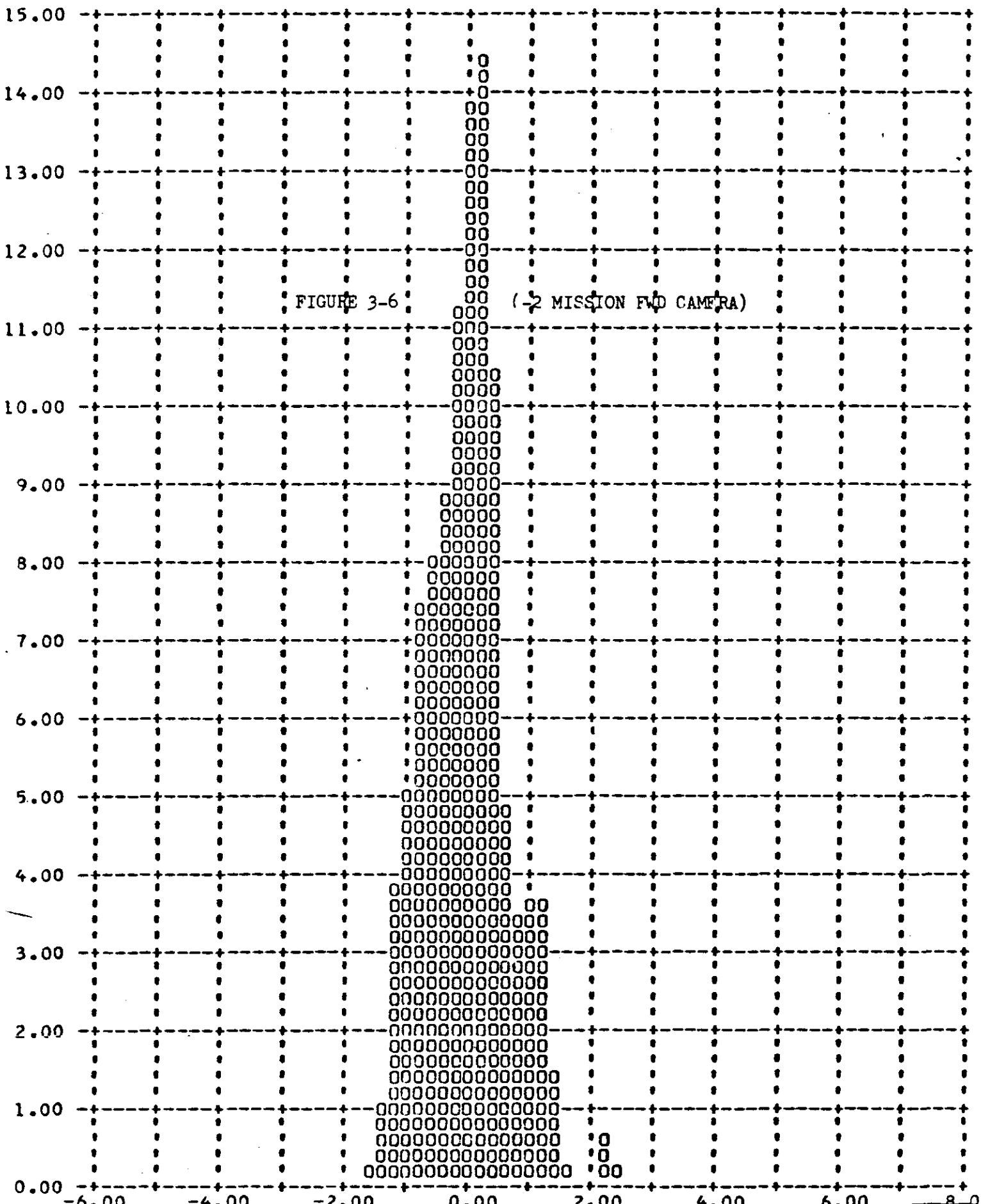


FIGURE 3-6 (-2 MISSION FWD CAMERA)

FRAMES 1-3 OF EACH OP OMITTED 90 PERCENT = 1.12

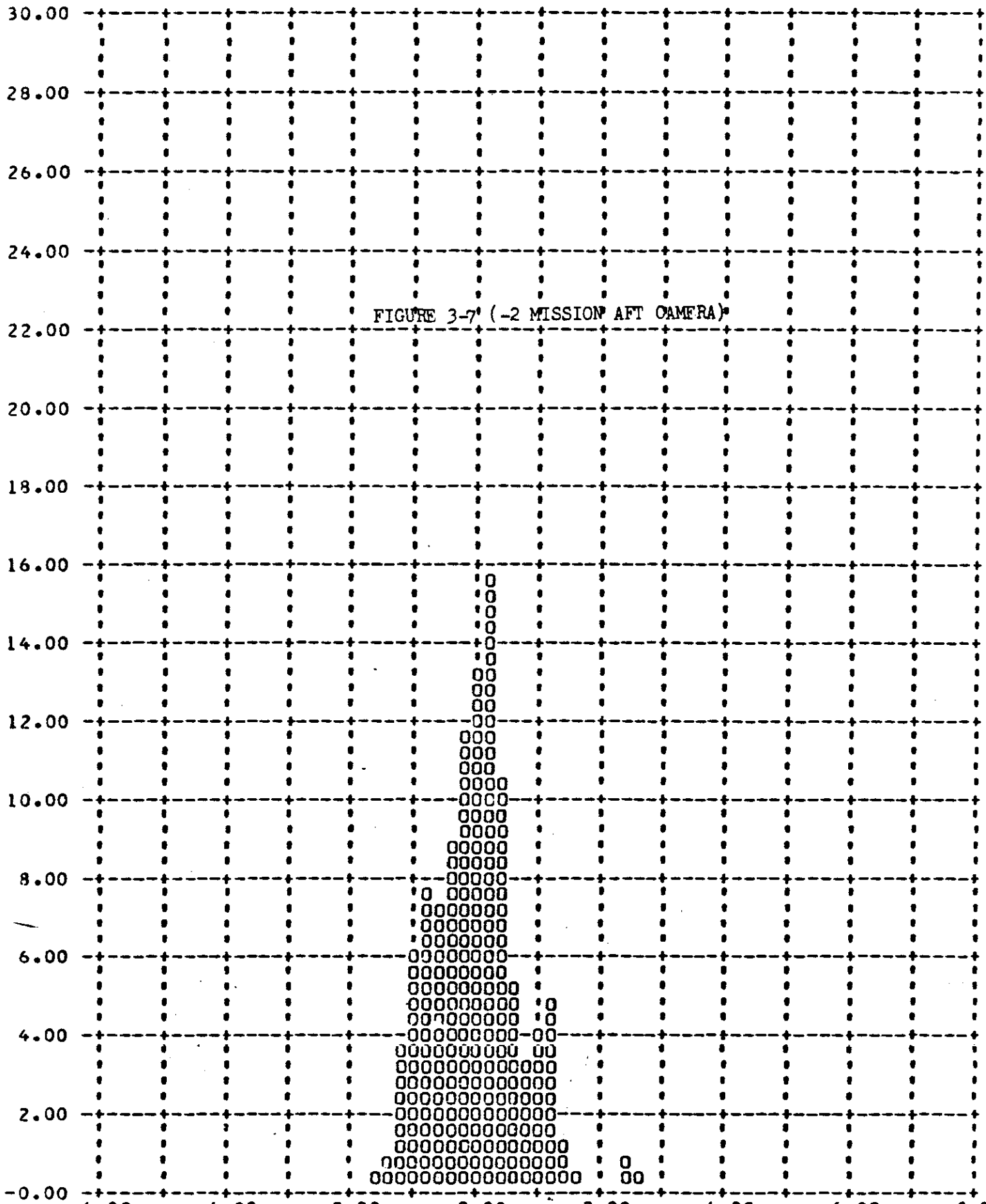


FIGURE 3-7 (-2 MISSION AFT CAMERA)

H. CLOCK SYSTEM PERFORMANCE

The clock system operated normally throughout both missions. Good correlations between clock and system time was obtained with the second order fit data recommended for time correlation. Correlation equations and constants were as follows:

First Order Fit

System Time = $A_0 + A_1$ (clock time)

where

A_0 = 166297.04306 Al = 0.9999998169647

Sigma = 0.00308547 No. of points 404

Second Order Fit

System Time = $A_0 + A_1$ (clock time) + A_2 (clock time)^2

where

A_0 = -166297.05489 A_1 = 0.9999998476421

A_2 = -0.53773788184484D-13 Sigma = 0.00123341

No. of points 404

I. PMU SYSTEM OPERATION

The PMU system utilized a dual bottle without a pulsing network. The surge valve controller timer (large orifice, time A) was reset to 1.3 seconds "on time" with the small orifice "on" continuously. The gas consumption was 4.4 lbs/min.

The PMU system operated satisfactorily throughout the flight and approximately 1500 psi remained at the conclusion of the -2 mission.

J. THERMAL ENVIRONMENT

The temperature data obtained during flight indicated that the temperature environment was slightly cooler than was predicted for the -1 mission. The -2 mission followed the lower end of the temperature vs beta angle prediction curve (refer to Figures 3-8 to 3-10). The average temperature for both cameras was 64° and remained almost constant throughout the mission.

K. RECOVERY SYSTEM PERFORMANCE

The -1 mission capsule was successfully recovered by air catch during Rev 115; all re-entry events were within tolerance. The impact was within tolerance although 40 miles north of predicted.

The -2 mission capsule was successfully recovered by air catch during Rev 309. All re-entry events were within tolerance as well as the impact.

L. SRV TAPE RECORDER SYSTEM

During the processing of the -1 mission SRV tape recorder, the ADAPS processor experienced a high loss of sync. This loss of sync was present on both Digital Data 1 and Digital Data 2.

The tape recorder in the -2 mission performed satisfactorily. A total of 237 minutes of data was recorded and processed from the two recorders.

M. POST EVENT 2 TESTING

Post event 2 flight testing consisted of activating the camera system on alternate revs to produce a heavy current load in order to deplete battery and monitor solar array power prior to vehicle re-entry. Heavy load was applied continuously from Revs 338 through 355. During Rev 355, the battery voltage dropped below 22 volts and the vehicle was stable and all systems operational.

The vehicle re-entered on 26 March 1970 during Rev 357. The point of im - pact was 12° south and 41° west.

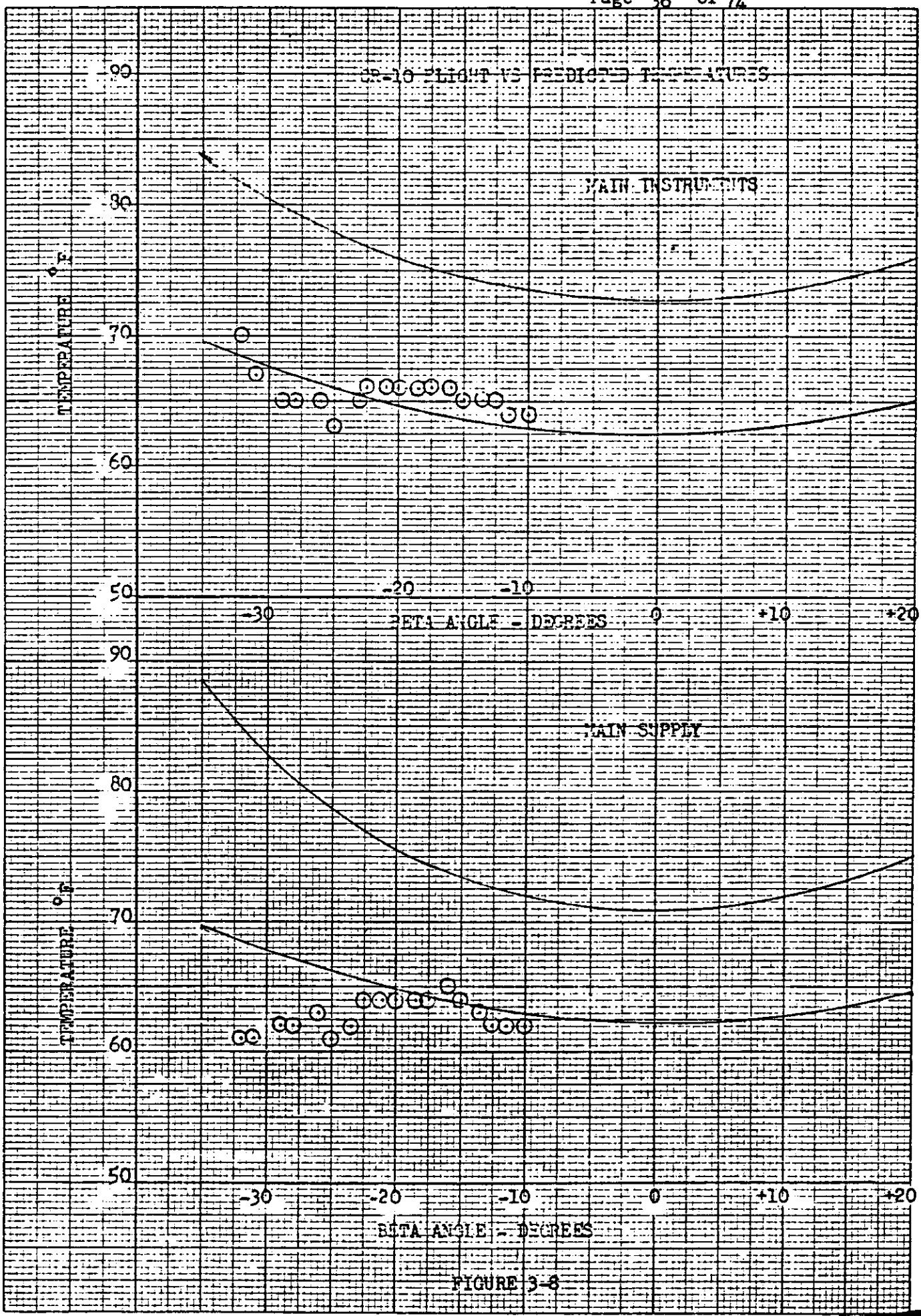

SR-10 FLIGHT VS PREDICTED TEMPERATURES
MAIN INSTRUMENTS
TEMPERATURE °F
90
80
70
60
50
-30
-20
-10
0
+10
+20
BETA ANGLE - DEGREES
MAIN SUPPLY
TEMPERATURE °F
90
80
70
60
50
-30
-20
-10
0
+10
+20
BETA ANGLE - DEGREES

FIGURE 3-8